REMARKS

Applicants have cancelled claims 1-7 and replaced them with similar claims 8-15 which are in a format that conforms to standard U.S. practice. No narrowing of the claims or surrender of subject matter is intended as a result of this replacement. Similarly, applicants submit a Substitute Specification, which is in a format that conforms to standard U.S. practice. No mew matter has been added.

Respectfully submitted,

BAKER BOTTS L.L.P.

By:____________________

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~~[Translation from German]~~SUBSTITUTE SPECIFICATION

~~WO 03/081634~~ ~~PCT/DE03/00962~~

~~Tube Magnetron~~

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] **This application claims the benefit of International Patent Application No. PCT/DE03/000962 filed March 24, 2003, which claims priority to German Patent Application No. 102 13 043.4 filed March 22, 2002.**

FIELD OF THE INVENTION

[0002] The invention relates to ~~a tube magnetron in a vacuum coating plant,~~**tube magnetrons. In particular, the invention relates to tube magnetrons** provided with ~~a~~ hollow rotating tube target ~~arrangement~~**arrangements** and ~~a magnet system. The magnet system has two magnetic field maxima in cross section arranged in the axial longitudinal direction of the tube target arrangement and in the interior thereof, the magnetic field passing through the tube target arrangement. The tube target arrangement has target plates extending longitudinally, which are fixed to a target support.~~**magnet systems, for applications in a vacuum or sputter coating processes.**

~~The magnetic field maxima indicated here and in the following are the maximum of the tangentially oriented magnetic field component on the target surface.~~

BACKGROUND OF THE INVENTION

[0003] Tube magnetrons of general type have long been known in use in vacuum coating **(e.g., sputter coating)** plants for coating various large-area substrates with a variety of coating materials. They are characterized by a high rate of utilization of the target material and long target life. A tube magnetron is described in German patent ~~DD~~**DE** 217,964 A3. Uniform rotation of the tube target results in uniform erosion of the sputter material on the tube target surface. Here, the tube target consists entirely of the material to be sputtered, such as for example of aluminum or titanium. Target cooling, realized in the interior of the tube target, owing to the more favorable heat transfer in the tube, is substantially more effective than in flat targets, which permits an increase in output with respect to the coating rate as compared with flat targets. Full-material tube targets of copper and titanium are likewise known in use by the applicant.

[0004] An additional tube magnetron is disclosed in ~~the printed source US~~**U.S. Patent No.** 4,356,073. Tube targets that consist of a supporting tube and a layer, coated all around, of the sputter material are used in this case. This layer consists principally of metallic sputter material and is applied chiefly by plasma spraying.

[0005] ~~The closest prior art, wherein~~**U.S. Patent No. 4,443,318 describes** a rotating magnetron ~~is~~ equipped with a tube target, which has a plurality of individual target strips with

the applied sputter material, fixed to a supporting tube~~, is described in US 4,443,318.~~. The target strips lie in individual grooves of the supporting tube and are pressed on the supporting tube by intermediary strips (claws) that are bolted to the target tube. This design permits the use of target materials produced in plate form on the surface of tube targets. This has the advantage of lower-cost and greater range of use of a variety of sputter materials because, depending upon the material, sometimes the production of plate material is simpler and more economical than the use of full-material tube targets and the plasma spray method and, in addition, sometimes only production in plate form is suitable, as for example in ceramic sputter materials with their greater hardness and brittleness.

[0006] Application of ceramic sputter material to the surface of a tube target is difficult by the plasma spray method, since the required material thickness and material homogeneity of the ceramic material compositions is not thereby obtained. Slight structural and alloy variations in certain ceramic sputter layers, such as for example in ~~ITO (~~(indium-zinc oxide alloy **(ITO**) or silicon oxide, result in process variations. Full-material tube targets of ceramic sputter material with the required properties likewise are not known in the present related art. The ceramic material sintered by the high-pressure pressing method has a high blocking density and hardness, owing to which this material cannot be processed in just any desired way. The plate form is therefore a preferred production form for ceramic sputter materials.

[0007] However, in the known tube targets covered with target plates the fact that the tangential bearing of the flat plates results in a variable radial distance of the surface of the target plates from the axis of rotation of the tube target and, in addition, owing to the supporting

mechanisms of the target plates (claws) surface regions without target material occur, whereby a polygonal tube target surface with inhomogeneous sections is produced, is disadvantageous. This surface of the tube target leads, in the coating process during the operation of rotation of the tube target owing to the stationary magnetic fields, to considerable fluctuations in the magnetic field effect and hence in the sputter rate and subsequently to fluctuations in the processing parameters of the plasma. Process uniformity as an essential condition for layer quality on the substrate is upset.

[0008] **Consideration is now being given to ways of improving tube magnetron designs for coating applications. In particular, attention is directed to designs of tube magnetron which lead to improved process uniformity in sputter coating applications. The tube magnetrons may be designed for a variety of sputter target materials including ceramic materials.**

SUMMARY OF THE INVENTION

[0009] **In accordance with the principles of the invention, tube magnetrons are provided for vacuum coating of materials such as ceramic materials or other high melting point materials by plasma sputtering processes. The tube magnetrons are provided with hollow rotating tube target arrangements and magnet systems.**

[0010] **An exemplary tube target arrangement has longitudinally extending target plates, which are fixed to a target support. The longitudinally extending target plates may be configured as a polygon. An exemplary magnet system generates magnetic fields in the interior of the tube magnetron. The magnet system is configured to generate at least two**

magnetic field maxima in cross section arranged in the axial longitudinal direction of the tube target arrangement. The magnetic field maxima refer to the maximum of the tangentially oriented magnetic field component on the target surface.

[0011] The number and width target plates and the configuration of the magnetic field are suitably selected to minimize plasma fluctuations or sputtering rate variations across the targets. In an exemplary designs of the tube magnetron, the number and width of target plates are selected so that an angle α, which is enclosed by two imaginary radial lines each running through adjacent corners of the target plates polygon, is related to an angle β, which is enclosed by two imaginary radial lines running through the magnetic field maxima at least approximately consistent with the relation $\beta = (n + 0.5)\ \alpha$, where n may be any non negative integer including zero.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] Further features of the invention, its nature, and various advantages will be more apparent from the following detailed description and the accompanying drawings, wherein like reference characters represent like elements throughout, and in which:

[0013] FIG. 1 is a cross sectional view of an exemplary tube magnetron designed in accordance with the principles of the present invention.

[0014] The following is a list of reference characters used in FIG. 1

1. Tube target

2 target support

3 target plate

4 polygon corner

5 polygon corner

6 polygon sink

7 width of target plate

8 longitudinal edge of target plate

9 central longitudinal axis of target plate

10 magnet system

11 magnetic field maximum

12 distance between magnetic field maxima

13 radial line through a polygon corner

14 radial line through a polygon corner

15 radial line through a magnetic field maximum

16 radial line through a magnetic field maximum

DETAILED DESCRIPTION OF THE INVENTION

[0015] **The present invention provides tube magnetron designs for coating of substrates with thin film materials. The tube magnetrons are designed for use with sputter targets made of materials (e.g., ceramic materials and high melting-point material) which are difficult to sputter coat using conventional tube magnetrons or other conventional sputtering arrangements.**

[0016] ~~The object of the invention is to obtain, in the use of target plates on tube targets, in particular of target plates of ceramics, for example of~~**The inventive tube magnetrons are configured to use sputtering target material which may be in the form of target plates disposed on tube target supports. The target plates may be made of ceramic material or high melting-point material (e.g.,** ITO, zinc oxide, silicon ~~and of~~**or** other ceramic, ceramic-like ~~and/or high melting-point~~ material~~,~~**). The tube magnetron designs can provide** improved process uniformity ~~as~~**in sputter coating operations, which is** an essential condition for high **coating** layer quality on the substrate. The coating quality ~~in the use of~~**obtained by using** tube targets with target plates ~~should be compared to~~ **in the inventive tube magnetrons can be superior to the** coating quality **obtained** using **conventional** tube targets that have been coated with sputter material or consist of full material~~, in order to permit~~**. The inventive tube magnetrons may be advantageously used for** more variable and less costly coating processes ~~in the use of~~**compared to conventional coating processes using** tube targets of like quality.

[0017] ~~This object is accomplished in that~~**In exemplary tube magnetrons designs,** the target plates are arranged adjacent to each other to form a polygon in cross section. The occurrence of surface regions without target material as inhomogeneous sections on the tube targets is thus avoided. This substantially reduces the irregular fluctuations of the magnetic field strength and of the sputter rate, which are produced due to alternating passage through the target plate surfaces and gaps between the plates free from sputter material by the magnetic fields of the magnet system.

[0018] ~~In a favorable embodiment of the invention~~**In one exemplary tube magnetron design**, the width and number of target plates is selected so that an angle α, which is enclosed by two imaginary radial lines each running through one corner of two adjacent corners of the polygon, is related to an angle β, which is enclosed by two imaginary radial lines running through the magnetic field maxima, as

$$\beta = (n + 0.5) \cancel{\cdot\alpha} \qquad \cancel{\text{with } (\alpha,} \quad \textbf{where } n = 0, 1, 2, 3, \cancel{4\ldots)}\textbf{4...}$$

[0019] In this way, the distance of each corner of the polygon from the central longitudinal line of a target plate is approximately equal to the distance between the magnetic field maxima in the region of the target plate surface.

[0020] A corner produces in the magnetic field maximum a comparatively small~~[...]~~, ~~an~~ areal **or surface** center – because of its fairly great proximity to the magnet system ~~–[...]~~ a comparatively high sputter rate. Owing to the design, in each instance a corner passes through the one magnetic field maximum, while an areal center passes through the other magnetic field

maximum. This results in a high sputter rate~~,~~ combined with a low sputter rate, in sum, an average sputter rate. Other sections on the polygon are related to one another in like fashion. Hence, peaks of the sputter rates are equalized in sum and fluctuations of the sputter rate, remaining despite the full-area arrangement of the target plates produced by the polygonal tube target surface, are further reduced.

[0021] In other words, upon passing through a location on the target surface having the greatest tube target radius "polygon corner" through the magnetic field, the magnetic field effect on the plasma space weakens and the sputter rate is reduced to a minimum, whereas passage through the location on the target surface having the smallest tube target radius ("polygon sink") results in an increase in the magnetic field effect and the sputter rate increases to a maximum. This decrease and increase in the sputter rate upon passage through the magnetic fields is equalized by the uniformly repeating position of a "polygon peak" and a "polygon sink," equal in time, in regions of the magnetic field of like intensity, preferably at its two maxima. Then, according to the distance between the magnetic field maxima and the width of the target plates in relation thereto, in each instance the longitudinal edge of the plate forming the polygon peaks and the central longitudinal line of any desired target plates forming the polygon sinks are combined together. This arrangement achieves the effect of damping the oscillating behavior of the sputter rate and thus process uniformity of new quality.

[0022] It is especially favorable to select the width and number of target plates so that

$$\beta = 1.5 \cdot \alpha.$$

[0023] In polygons with a variable number of corners, the following angles of the magnetic field maxima then result:

~~in~~**In** a hexagonal polygon: $\beta = 90°$

~~in~~**In** an octagonal polygon: $\beta = 67.5°$

~~in~~**In** a decagonal polygon: $\beta = 54°$

~~in~~**In** a dodecagonal polygon: $\beta = 45°$, etc.

[0024] These angles permit target plate widths that can be readily achieved technologically.

[0025] In a favorable embodiment of the invention, the target plates are cemented or bonded to the target support. This technology facilitates the adjacent placement of the target plates on the target tube and avoids fixing means, which result in an inhomogeneous surface structure of the tube target.

[0026] In an advantageous embodiment of the invention, the target plates consist of ceramics, for example of ITO, zinc oxide, silicon, and of other ceramic, ceramic-like and/or high melting-point material, which are hard to apply to a tube target by other methods.

[0027] In an additional embodiment of the invention, the tube targets are capable of rotation at a speed of 1 s-1 to 2 min-1. **Suitable rotation mechanisms which may be**

conventional can be deployed for this purpose. Thus, the speed of the tube target can be optimally adjusted to target plates of various widths.

[0028] Lastly, in an application of the invention, it is provided that equalization of minimal fluctuations of the plasma or the sputter rate is effected by a voltage control or by a plasma emission monitor control.

[0029] Effective compensation of sputter rate fluctuation by the target plate arrangement according to the invention is further improved by this control.

[0030] ~~The invention is to be described in detail below by an exemplary embodiment. The accompanying drawing~~**An exemplary tube magnetron designed according to the foregoing design principles is shown in FIG. 1. In particular, FIG. 1** shows a cross section **view** through a tube target with target plates affixed ~~according to the invention~~ and a magnet system lying within **the tube magnetron**.

[0031] ~~Here, the~~**The tube** magnetron is equipped with a rotating tube target 1, which is comprised of a tubular target support 2, to which a plurality of individual longitudinally extended flat target plates 3 with applied sputter material, such as for example ITO, zinc oxide, silicon and other ceramic, ceramic-like and/or high melting-point material, are cemented or bonded on adjacent to each other. The tangential bearing of the flat target plates 3 on the tubular target support 2 forms a continuous but polygonal target surface with polygon corners 4 and polygon sinks 6 on the tube target 1.

[0032] Owing to their shape, the longitudinal edges 8 of the target plates 3 geometrically form the polygon corners 4 and the central longitudinal axis 9 of the target plates 3, and considered geometrically, the polygon sinks 6 of the target surface.

[0033] In the interior of the tube target 1 is found the stationary magnet system 10, which produces a magnetic field with two magnetic field maxima 11, which pass through the tube target 1 at a distance 12 dependent upon the shape of the magnet system 10. The maximum possible sputter rate is reached at the core zones of the magnetic field, i.e., approximately in the region of the two magnetic field maxima 11, outside of which the sputter rate decreases.

[0034] The width 7 of each target plate 3 and the number of target plates 3 is selected so that an angle αÿ, which is enclosed by two imaginary radial lines 13 and 14 each running through a corner of two adjacent corners 4 and 5 of the polygon, is related to an angle βÿ, which is enclosed by two imaginary radial lines 15 and 16 running through the magnetic field maxima 11, as

$$\beta = (n + 0.5) \cdot \alpha \qquad \text{with } n = 1, \text{ i.e.,}$$

$$\beta = 1.5 \cdot \alpha$$

[0035] As a result, the distance of each longitudinal edge 8 of the target plates 3 from the central longitudinal axis 9 of the adjacent target plate is approximately equal to the distance 12 between the magnetic field maxima in the region of the target plate surface. There, two geometrically significant points (each polygon corner 4 and polygon sink 6) are simultaneously located during rotation of the tube target 1 in one of the two magnetic field maxima 11 in each

instance. At the same time, the variations in sputter rate, which occur due to the variable radial distance of the tube target surface from the axis of rotation of the tube target 1 and hence from the stationary magnet system 10, are cancelled. If a number of magnetic fields are used, the arrangement should be undertaken in analogous fashion, so that the same number of polygon corners 4 and polygon sinks 6 are in the magnetic field maxima 11 equal in time.

WHAT IS CLAIMED IS:

~~Tube Magnetron~~

~~List of Reference Numerals~~

~~1~~ ~~tube target~~

~~2~~ ~~target support~~

~~3~~ ~~target plate~~

~~4~~ ~~polygon corner~~

~~5~~ ~~polygon corner~~

~~6~~ ~~polygon sink~~

~~7~~ ~~width of target plate~~

~~8~~ ~~longitudinal edge of target plate~~

~~9~~ ~~central longitudinal axis of target plate~~

~~10~~ ~~magnet system~~

~~11~~ ~~magnetic field maximum~~

~~12~~ ~~distance between magnetic field maxima~~

~~13~~ ~~radial line through a polygon corner~~

~~14~~ ~~radial line through a polygon corner~~

~~15~~ ~~radial line through a magnetic field maximum~~

~~16~~ ~~radial line through a magnetic field maximum~~

~~Tube Magnetron~~

~~Claims~~

~~1.~~ ~~Tube~~**8. (new) A tube** magnetron ~~of a vacuum coating plant, which is provided with~~ **comprising:**

a hollow rotating tube target arrangement~~, and with a magnet system, which in cross section has two magnetic field maxima and which is arranged in the axial longitudinal direction of the tube target arrangement and in the interior thereof, where the magnetic field passes through the tube target arrangement and the tube target arrangement has~~ **of** longitudinally extended target plates that are fixed to a target support, ~~characterized in that~~**wherein** the target plates ~~(3)~~ in cross section are arranged adjacent to each other to form a polygon~~.~~**; and**

~~2.~~ ~~Tube magnetron according to Claim 1, characterized in that the width and number of target plates (3) is selected so that an angle α, which is~~

a magnet system, wherein the magnet system provides a magnetic field passing through the tube target arrangement, wherein the magnetic field has in cross section two maxima arranged in the axial longitudinal direction of the tube target arrangement and in the interior thereof.

9. (new) The tube magnetron of claim 8, wherein the width and number of target plates are selected so that an angle ÿ, which is enclosed by two imaginary radial lines ~~(13, 14)~~ each running through ~~a corner (4; 5) of two adjacent corners (4; 5) of the polygon, is~~

~~related to an angle β, which is enclosed by two imaginary radial lines (15; 16) running through the magnetic field maxima (11), as~~

~~$\beta = (n + 0.5) \cdot \alpha$ with (n = 0, 1, 2, 3, 4 ...).~~**adjacent corners of the polygon, is related to an angle ÿ, which is enclosed by two imaginary radial lines running through the magnetic field maxima as $\beta = (n + 0.5)\ \alpha$ wherein n is select to be an integer (n = 0, 1, 2, 3, 4 ...).**

~~3.~~ ~~Tube~~**10. (new) The tube** magnetron ~~according to Claim 2, characterized in~~**of claim 9, wherein n selected to be 1 so** that $\beta = 1.5\ \cancel{\cdot}\alpha$.

~~4.~~ ~~Tube~~**11. (new) The tube** magnetron ~~according to any of Claims 1 to 3, characterized in that~~**of claim 8 wherein** the target plates ~~(3)~~ are cemented or bonded to the target support**.**

12. (~~2)~~new) The tube magnetron of claim 8 wherein the target plates comprise target material selected from the group of ceramic materials, ceramic-like materials, high melting-point materials and any combination thereof.

~~5. Tube magnetron according to Claims 1 to 4, characterized in that the target plates (3) consist of ceramics for example of ITO, zinc oxide, silicon and of other ceramic, ceramic-like and/or high melting-point material.~~

13. (new) The tube magnetron of claim 12 wherein the target material comprises one of ITO, zinc oxide, and silicon.

~~6. Tube magnetron according to Claims 1 to 5, characterized in that the tube target (1) is capable of rotation~~14. (new). The tube magnetron of claim 8 which is further configured so that the tube target rotates at a speed of ~~1~~about 1 revolution s^{-1} to ~~2~~about 2 revolutions min^{-1}.

15. (new) A tube magnetron for sputtering of target material by a plasma on application of a voltage, comprising:

a hollow rotating tube target arrangement of longitudinally extended target plates that are fixed to a target support; and

a magnet system configured to provide a magnetic field passing through the tube target arrangement,

~~7. Use of a tube magnetron according to any of Claims 1 to 6, characterized in that equalization of minimal fluctuations of the plasma or of the~~wherein the target plates in cross section are arranged adjacent to each other to form a polygon, wherein the magnetic field has in cross section two maxima arranged in the axial longitudinal direction of the tube target arrangement, and wherein the tube magnetron is further configured so that in operation equalization of at least one of plasma fluctuations and sputter rate fluctuations is effected by ~~a~~at least one of an applied voltage control ~~or by~~and a plasma emission monitor control.

ABSTRACT OF THE DISCLOSURE

A tube magnetron for a vacuum coating applications such as plasma sputtering is provided with a hollow rotating tube target arrangement and a magnet system. The hollow rotating tube target arrangement has longitudinally extended target plates that are fixed to a target support. The target plates in cross section are arranged adjacent to each other to form a polygon. The magnet system generates a magnetic field which extends through the tube target arrangement. The magnet system is configured so that generated magnet field has in cross section two maxima arranged in the axial longitudinal direction of the tube target arrangement. The tube magnetron is configured for use with sputtering targets that are in the form of target plates. The target plates may be made from ceramics, ceramic-like and/or high-melting point materials. Materials such as ITO, zinc oxide, silicon can be efficiently and uniformly sputter coated on substrates.

Document comparison done by DeltaView on Friday, October 29, 2004 4:19:16 PM

Input:	
Document 1	PowerDocs://NY02/499825/1
Document 2	PowerDocs://NY02/502845/2
Rendering set	1-Bold Underline-Strikethrough

Legend:	
Insertion	
~~Deletion~~	
~~Moved from~~	
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Style change	
Format change	
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Inserted cell	
Deleted cell	
Moved cell	
Split/Merged cell	
Padding cell	

Redline Summary:		
No.	**Change**	**Text**
1	Insertion	A36381-PCT-USA - 066340.0211
2	Insertion	PATENT
3-5	Change	"NY02:499825.11" changed to "NY02:502845.2 -1-"
6-7	Change	"[Translation from German]" changed to "SUBSTITUTE SPECIFICATION"
8	Deletion	WO 03/081634 PCT/DE03/00962
9	Deletion	Tube Magnetron
10	Insertion	CROSS REFERENCE TO RELATED APPLICATIONS
11-12	Insertion	[0001] This application...filed March 22, 2002.
13	Change	"[0002]" changed to "FIELD OF THE INVENTION[0002]"
14-15	Change	"provided with" changed to "a tube magnetron in a...magnetrons provided with"
16	Change	"provided with a hollow rotating" changed to

		"provided with hollow rotating"
17-18	Change	"tube target arrangement and" changed to "tube target arrangements and"
19-20	Change	"and a magnet system. The...to a target support." changed to "and magnet systems, for...coating processes."
21	Deletion	The magnetic field maxima...on the target surface.
22	Insertion	BACKGROUND OF THE INVENTION
23	Change	"plants for" changed to "(e.g., sputter coating) plants for"
24-25	Change	"German patent DD 217,964 A3." changed to "German patent DE 217,964 A3."
26	Insertion	the printed source
27-28	Change	"US 4,356,073." changed to "U.S. Patent No. 4,356,073."
29-30	Change	"a rotating" changed to "The closest prior art,...describes a rotating"
31	Change	"rotating magnetron is equipped with" changed to "rotating magnetron equipped with"
32-33	Change	"supporting tube, is...4,443,318. The target" changed to "supporting tube. The target"
34	Change	"indium-zinc" changed to "ITO (indium-zinc"
35	Change	"oxide alloy) or silicon" changed to "oxide alloy (ITO) or silicon"
36-37	Insertion	[0008] Consideration is...ceramic materials.
38	Insertion	SUMMARY OF THE INVENTION
39-40	Insertion	[0009] In accordance with...and magnet systems.
41-42	Change	"" changed to "[0010] An exemplary tube...on the target surface."
43-44	Insertion	[0011] The number and...integer including zero.
45	Insertion	BRIEF DESCRIPTION OF THE DRAWINGS
46-47	Insertion	[0012] Further features...and in which:
48-49	Insertion	[0013] FIG. 1 is a cross...the present invention.
50-51	Insertion	[0014] The following is a...used in FIG. 1

52	Insertion	1. Tube target
53	Insertion	2 target support
54	Insertion	3 target plate
55	Insertion	4 polygon corner
56	Insertion	5 polygon corner
57	Insertion	6 polygon sink
58	Insertion	7 width of target plate
59	Insertion	8 longitudinal edge of target plate
60	Insertion	9 central longitudinal axis of target plate
61	Insertion	10 magnet system
62	Insertion	11 magnetic field maximum
63	Insertion	12 distance between magnetic field maxima
64	Insertion	13 radial line through a polygon corner
65	Insertion	14 radial line through a polygon corner
66	Insertion	15 radial line through a magnetic field maximum
67	Insertion	16 radial line through a magnetic field maximum
68	Insertion	DETAILED DESCRIPTION OF THE INVENTION
69-70	Insertion	[0015] The present...sputtering arrangements.
71-72	Change	"ITO, zinc oxide," changed to "The object of the...(e.g., ITO, zinc oxide,"
73-74	Change	"oxide, silicon and of other ceramic," changed to "oxide, silicon or other ceramic,"
75	Change	"ceramic-like and/or high melting-point material" changed to "ceramic-like material"
76-77	Change	"material, improved process" changed to "material). The tube...provide improved process"
78-79	Change	"uniformity as an essential" changed to "uniformity in sputter...which is an essential"
80	Change	"condition for high layer quality" changed to "condition for high coating layer quality"
81-82	Change	"coating quality in the use of tube targets" changed to "coating quality obtained by using tube targets"
83-84	Change	"target plates should be...to coating quality" changed to "target plates in the...to the coating

		quality"
85	Change	"coating quality using" changed to "coating quality obtained using"
86	Change	"using tube targets" changed to "using conventional tube targets"
87-88	Change	"full material, in order to permit more variable" changed to "full material. The...used for more variable"
89-90	Change	"coating processes in the use of tube targets" changed to "coating processes...using tube targets"
91-92	Change	"the target" changed to "This object is...designs, the target"
93-94	Change	", the width" changed to "In a favorable embodiment...design, the width"
95-96	Change	"= (n + 0.5) · α with (n = 0, 1, 2," changed to "= (n + 0.5) α, where n = 0, 1, 2,"
97-98	Change	"0, 1, 2, 3, 4…)." changed to "0, 1, 2, 3, 4. ."
99	Change	".[0019]" changed to ". .[0019]"
100	Change	"," changed to "[…],"
101	Change	", an areal" changed to ", areal"
102	Change	"areal center – because" changed to "areal or surface center – because"
103	Change	"magnet system – […] a comparatively" changed to "magnet system – a comparatively"
104	Change	"sputter rate, combined with" changed to "sputter rate combined with"
105	Change	"α." changed to "· α."
106-107	Change	"a hexagonal" changed to "inIn a hexagonal"
108-109	Change	"in an octagonal" changed to "In an octagonal"
110-111	Change	"in a decagonal" changed to "In a decagonal"
112-113	Change	"in a dodecagonal" changed to "In a dodecagonal"
114	Change	"Thus, the speed" changed to "Suitable rotation... Thus, the speed"
115	Change	"it is provided" changed to ", it is provided"
116-117	Change	"shows a cross" changed to "The invention is to be...FIG. 1 shows a cross"
118	Change	"cross section through a tube" changed to "cross section view through a tube"
119	Change	"plates affixed according...invention and a magnet" changed to "plates affixed and a magnet"
120	Change	"lying within." changed to "lying within the tube magnetron."
121-122	Change	"magnetron is" changed to "Here, theThe tube magnetron is"

123-124	Change	", which is enclosed" changed to "αÿ, which is enclosed"
125-126	Change	"to an angle β, which is enclosed" changed to "to an angle ÿ, which is enclosed"
127	Change	"= (n + 0.5) · αwith n =" changed to "= (n + 0.5) α with n ="
128	Deletion	n = 1, i.e.,
129	Change	"β = 1.5 · α" changed to "β = 1.5 α"
130	Insertion	WHAT IS CLAIMED IS:
131	Deletion	Tube Magnetron
132	Deletion	List of Reference Numerals
133	Deletion	1 tube target
134	Deletion	2 target support
135	Deletion	3 target plate
136	Deletion	4 polygon corner
137	Deletion	5 polygon corner
138	Deletion	6 polygon sink
139	Deletion	7 width of target plate
140	Deletion	8 longitudinal edge of target plate
141	Deletion	9 central longitudinal axis of target plate
142	Deletion	10 magnet system
143	Deletion	11 magnetic field maximum
144	Deletion	12 distance between magnetic field maxima
145	Deletion	13 radial line through a polygon corner
146	Deletion	14 radial line through a polygon corner
147	Deletion	15 radial line through a magnetic field maximum
148	Deletion	16 radial line through a magnetic field maximum
149	Deletion	Tube Magnetron
150	Deletion	Claims
151-152	Change	"1. Tube magnetron" changed to "8. (new) A tube magnetron"
153-154	Change	"magnetron of a vacuum...which is provided with" changed to "magnetron comprising:"
155-156	Change	"arrangement, and with a...has longitudinally" changed to "arrangement of longitudinally"
157-158	Change	"target support, characterized in that the target" changed to "target support, wherein the target"
159	Change	"target plates (3) in cross section" changed to "target plates in cross section"
160-161	Change	"form a polygon." changed to "form a polygon; and"
162	Deletion	2. Tube magnetron...an angle α, which is

163	Insertion	a magnet system, wherein...in the interior thereof.
164	Change	"enclosed by" changed to "9. (new) The tube...ÿ, which is enclosed by"
165	Change	"radial lines (13, 14) each running" changed to "radial lines each running"
166	Deletion	running through a corner...field maxima (11), as
167-168	Change	"$\beta = (n + 0.5) \cdot \alpha$ with (n = 0, 1, 2, 3, 4 ...)." changed to "adjacent corners of the...(n = 0, 1, 2, 3, 4 ...)."
169-170	Change	"3. Tube magnetron" changed to "10. (new) The tube magnetron"
171-172	Change	"magnetron according to...in that $\beta = 1.5$" changed to "magnetron of claim 9,...to be 1 so that $\beta = 1.5$"
173	Change	"that $\beta = 1.5 \cdot \alpha$." changed to "that $\beta = 1.5\ \alpha$."
174-175	Change	"4. Tube magnetron" changed to "11. (new) The tube magnetron"
176-177	Change	"magnetron according to...in that the target" changed to "magnetron of claim 8 wherein the target"
178	Change	"target plates (3) are cemented" changed to "target plates are cemented"
179	Insertion	target support.
180	Change	"(" changed to "12. ("
181-182	Change	"(2)." changed to "(new) The tube magnetron...any combination thereof."
183	Deletion	5. Tube magnetron...melting-point material.
184	Insertion	13. (new) The tube...zinc oxide, and silicon.
185-186	Change	"6. Tube magnetron...of rotation at a speed" changed to "14. (new). The tube...rotates at a speed"
187-188	Change	"a speed of 1 s^{-1} to" changed to "a speed of about 1 revolution s^{-1} to"
189-190	Change	"s^{-1} to 2 min^{-1}." changed to "s^{-1} to about 2 revolutions min^{-1}."
191	Insertion	15. (new) A tube...a voltage, comprising:
192	Insertion	a hollow rotating tube...to a target support; and
193	Insertion	a magnet system...tube target arrangement,
194-195	Change	"7. Use of a tube...or of the sputter rate" changed to "wherein the target plates...and sputter rate"
196	Change	"sputter rate is effected" changed to "sputter rate fluctuations is effected"

197-198	Change	"effected by a voltage control" changed to "effected by at least one...applied voltage control"
199-200	Change	"voltage control or by a plasma emission" changed to "voltage control and a plasma emission"
201	Insertion	ABSTRACT OF THE DISCLOSURE
202	Insertion	A tube magnetron for a...coated on substrates.

Statistics:	
	Count
Insertions	112
Deletions	90
Moved from	0
Moved to	0
Style change	0
Format changed	0
Total changes	202